



low-impact sewage treatment



what is it?

It's any kind of treatment of sewage that attempts to minimise pollution and the use of water, energy and synthetic chemicals, and to turn our waste into something useful (fertiliser / soil improver).

Sewage treatment is the process of settlement and aeration used to reduce pollution of rivers or coastal waters by our sewage effluent. This typically involves the addition of energy and chemicals and the generation of sludges (of low value or even a toxic nature).

Sewage is the term used to describe domestic and municipal effluent (sewerage, by contrast, is the infrastructure itself - the pipework, sewers etc.). Sewage is typically comprised of 'black water' (from toilets) and 'grey water' (from sinks, showers, washing machines etc.). Industrial effluents may also be included within municipal sewage. In a 'combined sewer' the runoff from roads, yards and roof surfaces (or stormwater) is also connected to the foul sewers. Connection of stormwater to domestic septic tanks is usually prohibited due to the excess loading on the treatment system during times of heavy rainfall.

In the context of low-impact living, sewage is a self-limiting term because it is by definition the combination of potentially useful elements into one gloriously unpleasant mess. Thus I will also mention dry toilets and source separation as part of the overall suite of solutions we can adopt.

So how do we find a way to treat sewage as a potential resource to be recycled instead of a waste to be disposed of? Generally when recycling, it's important to keep different waste streams as separate and as clean as possible. This is no different with domestic wastewater, which has many useful constituent elements. So, some terms are gaining increasing use within wastewater engineering and design, as follows:

- Yellow water: urine - with or without small volumes of water used for urinal or urine-separation toilet flushing.
- Brown water: flush water leaving a faecal separation system such as an Aquatron unit.
- Humanure: contents of dry toilets or faecal separation systems.
- Humanure compost: made from humanure - ideally a clean, nutrient-rich humic material.
- SUDS: Sustainable Urban Drainage Systems are filtration and/or attenuation systems used as part of urban drainage or even for one-off roof surfaces, yards or car parks. They help balance the runoff volumes from rainfall events and filter the water prior to discharge back into streams or groundwater.



Aquatron separator unit for faecal separation and composting.

what are the benefits?

Proper sewage treatment is vital to the health of our environment. One of the challenges with our current sewage infrastructure is that it's heavily reliant on fossil fuel inputs. The importance of removing sewage from our homes and treating it in on-site or municipal treatment systems can be easily overlooked until problems arise. Without ongoing power supply to run blowers and pumps, our sewage infrastructure will fail, and can discharge untreated sewage into groundwater, rivers and seas. Many low-impact alternatives are more resilient to electricity shortages as they rely on gravity to function. Examples include reed beds, constructed wetlands, zero-discharge willow systems and willow filters, and a range of source-separation technologies such as urine diversion toilets, faecal separator units and dry toilets. The lack of electricity input means they achieve good effluent quality with a lower carbon footprint.

Clean water is one of the essential requirements for a healthy life. Effective sanitation keeps our local groundwater and surface waters clean and healthy. We rely on a clean aquatic environment for drinking water, washing and cleaning, industry, agriculture, tourism and recreation. It's also home to plants and animals in streams, rivers, lakes, ponds, wetlands, fens, bogs, estuaries and other coastal waters. These habitats in turn provide many and various ecosystem services such as food supply, water filtration and storage, flood prevention or amelioration etc.

Willow systems take up phosphates and nitrates, reducing the need for chemical dosing for nutrient removal. Willows also absorb atmospheric carbon and can be used as a carbon-neutral fuel to offset heating oil. They also provide habitat and enhance biodiversity.



Zero-discharge willow system: fresh growth in the foreground after coppicing the previous February. Behind that is growth in its third year, due to be coppiced the following February.

what can I do?

Most low-impact sewage treatment requires space for an on-site system. In urban areas, you'll be restricted to mains sewers or a compost toilet if you have space in your garden for utilising the rich soil that is the result. However, peeing on your compost heap is a good way to recycle N, P and K into your soil and keep it out of the municipal system. If you're not connected to a mains sewer there are more options. Septic tanks and percolation areas are the most common on-site system, and where good depths of unsaturated soil exists for filtering effluent, these can be low-cost, low-carbon and effective. But they need maintenance - annual desludging is typically recommended, or at least checking sludge depth and emptying as necessary.

Mechanical aeration units are used where soils are inadequate for good filtration, but these typically require electricity inputs, which isn't great environmentally, and the running costs can mount up. Media filter units using peat, rock wool or coconut fibre are pump fed, so are still reliant on electricity, but they're more energy-efficient than aeration units which need power 24/7. Also, the 3 media types above are either stripped from natural peatland, require high-energy inputs or are shipped around the world, which isn't low-impact either. By contrast, reed beds function without electricity, where falls exist for gravity to do the

work, so they're resilient to power shortages and have a zero-carbon footprint in operation.

Willow systems are also planted treatment systems. As they grow they absorb carbon, so can be carbon negative over their lifetime, helping provide fuel as well as treating sewage.

Dry toilets are the archetypal low-impact sanitation option. Properly designed compost toilets have no discharge to ground or surface water, use no water for flushing, sequester carbon as compost, and return biomass and nutrients to the earth.

Dry toilets are a form of source separation. Others include urine-diverting toilets, urinals (if the urine is collected for use as a fertiliser), faecal filter systems such as woodchip filters or faecal separators. There are many ways to protect our environment from sewage pollution and gain benefits such as biomass and nutrient cycling. If we use more sustainable methods in our homes, this may see a gradual shift in society to more sustainable systems for general use.

resources

- see lowimpact.org/sewage for more info, courses, links & books, including:
- Grant, Moodie & Weedon, *Choosing Ecological Sewage Treatment*
- Carol Steinfeld, *Reusing the Resource*
- Lloyd Kahn, the *Septic Systems Owners' Manual*
- aquatron.se - fecal separator
- wras.co.uk - UK water regulations
- oasisdesign.net - great resource on ecological water systems



Waterless urinals don't use mains water to flush, and can divert urine to be diluted (or composted with straw, sawdust etc.) and used as fertiliser.

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